Several important papers on fungi appear in the Twenty-first Annual Report of the Nebraska Experiment Station, viz., "Some Tomato Fruit-rots during 1907," by Miss V. W. Pool, with ten plates; "A New Form of Sphaeropsis on Apples," by Miss L. B. Walker, with ten text illustrations; "Seed Treatment for the Smuts of Winter Barley," by Dr. F. D. Heald, with four text illustrations; "The Mold of Maple Syrup," by Dr. F. D. Heald and Miss V. W. Pool, with seven text illustrations; "A Rot of Grapes due to *Pestalozzia uvicola*," by F. A. Wolf, with one plate.

An excellent popular description of the "Smuts of Sorghum" by Dr. E. M. Freeman and H. J. C. Umberger is published by the United States Department of Agriculture as Circular No. 8, of the Bureau of Plant Industry.

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*GEOLOGY AND RADIOACTIVE SUBSTANCES*

A paper of uncommon interest, particularly to geology and geophysics, has just appeared as a *Bulletin of the Geological Society of America* (vol. 19, pp. 113–146). The author, Dr. George F. Becker, of the U. S. Geological Survey, has brought together the physical data upon radioactive substances, reviewed them carefully for the information of any to whom they are not familiar, and then discussed their bearing on the solution of some of the great questions of terrestrial and cosmogonic history.

Assuming that the relation now established between helium, radium and uranium points to the common origin of the chemical elements, Dr. Becker calls attention to the fact that only helium, hydrogen and nebulium have been identified in the nebulæ, and that an orderly progression can be noticed in the atomic weight of the identifiable elements found in the stars. "Helium stars pass by the finest gradations into hydrogen stars of the Sirian type and these again into Solar stars" which contain elements of atomic weight as high as barium (137.4). The spectroscope has never indicated the presence of uranium in any celestial body, in the sun, or in meteoric matter, although helium is widely distributed. Furthermore, the uranium and thorium minerals on the earth are confined to the pegmatitic facies of the granites and syenites. There is, therefore, abundant incentive for a comprehensive investigation of a direct evolution of the elements from lowest to highest atomic weight, and the progress of this evolution will bear the closest relation to the evolution of our present earth.

Dr. Becker does not believe that inferences as to the age of the earth are competently drawn from the ratio of uranium to helium or to lead in particular minerals (Rutherford, Boltwood). Neither does the assembled physical evidence indicate that the high temperature of the interior of the earth is due in any considerable part to radioactivity (Dutton), though perhaps one tenth of the surface temperature gradient may be of such origin. This would accord with the determinations of the earth's age—not far from sixty million years—made by methods independent of the surface temperature-gradient, including his own discussion of a cooling globe printed in Science last February. There are definite limits of depth below which radioactive matter can not be expected and there is a conspicuous absence of uniformity in its distribution, the concentration in the ocean beds being particularly important.

Dr. Becker closes with a new and ingenious theory of the formation of granite which undertakes to account for the enormous energy content of the radioactive group of minerals. Supposing the earth to have sometime presented a surface of rhyolitic or trachytic magma, it may be supposed to have solidified under stable conditions at about 1,300°, surrounded by its atmosphere of water vapor far above the critical temperature of water. It is now assumed that granite must have formed by the surface action of water vapor (aqueo-igneous fusion) upon the rhyolitic or trachytic mass and that the temperature must have fallen below 800° for the stable formation of quartz. In the interval there must have been opportunity for a tremendous potentialization of energy near the

surface. What offers a better repository for this than the formation of elements of high atomic weight which would then constitute with the granite a surface layer of limited thickness or a radioactive shell, as Dr. Becker terms it?

The whole paper is of extraordinarily suggestive character, not only in the direction of pure speculation, where but scanty data can ever be gathered, but in offering several points of contact with direct laboratory measurement.

ARTHUR L. DAY

## SPECIAL ARTICLES

### PREGLACIAL DRAINAGE IN CENTRAL-WESTERN NEW YORK[1]

THE present drainage in central-western New York is to the north. The principal river is the Genesee, which traverses the entire state from the Pennsylvania line, beyond which it rises, to Lake Ontario. Its principal tributary is the Canaseraga, which joins it below Mount Morris.

Throughout Allegany County, the Genesee flows in a comparatively broad and open valley with sloping drift-covered sides, and with more or less drift-filling in its bottom. In a few places the bed rock shows in the river bed, indicating that the drift-filling in the bottom of the valley is not deep. The middle portion of the river lies in a series of gorges, with a total length of about 20 miles. The first of these gorges begins opposite Portageville, and in it occurs the upper Portage falls, about 70 feet high. Beyond this the river passes across an ancient drift-filled valley, the rock floor of which lies nearly at the level of the present river below the upper falls. A partial reexcavation of this valley has produced Glen Iris. Having crossed the ancient valley on its rock bottom, the river drops a further 100 feet, cutting a gorge into the northeastern rock wall of the ancient valley to a depth of 365 feet. A mile and a quarter beyond this, the river again emerges into an ancient drift-encumbered valley, into the rock floor of which it has incised a narrow canyon. Just before this ancient valley is reached, the river makes a final drop of nearly a hundred feet, in the lower falls. The Genesee is thus incised at the lower falls about 250 feet below the rock bottom of the ancient valley which it crosses at Glen Iris. The distance between the two points is a mile and a half. The bottom of the gorge below the lower falls is likewise nearly 200 feet below the rock bottom of the ancient valley at that point. The two ancient valleys thus crossed by the modern stream have accordant bottoms. They are, however, two distinct valleys which join opposite Portageville, where the system of gorges begins. We will speak of these ancient valleys as the Glen Iris Valley, and as the Lower Falls Valley, respectively. The name Upper Genesee Valley is given to the open valley in which that river flows from its source to Portageville. The Glen Iris Valley and the Lower Falls Valley unite southward, and from Portageville south are continued as a single valley in the Upper Genesee Valley. A third narrower drift-filled valley joins the Upper Genesee Valley at this point, its mouth being at the head of the first of the postglacial gorges. Thus three ancient valleys, now drift filled, unite at Portageville, one from the north (Lower Falls Valley) a second from the northwest (Glen Iris Valley) and a third from the west. These valleys are con-

[1] Abstract of a paper presented before the New York Academy of Sciences, Section of Geology and Mineralogy, December 2, 1907. Read by title, Albuquerque meeting of the Geological Society of America, December 31, 1907. Only the main points are here discussed; the complete paper, which will appear shortly, will contain a detailed discussion of the critical points of the region. Since the manuscript of this paper was submitted (January, 1908) Fairchild's discussion of the drainage of this region (Bull. N. Y. State Mus. 118, January, 1908) and Spencer's "Evolution of the Falls of Niagara" (Can. Geol. Survey) have been received. In both the northward drainage systems are defended. Fairchild treats all the valleys as obsequent streams tributary to a westward flowing Ontario River, while Spencer reasserts the existence of his Laurentian River. These papers will be fully considered in the more extended discussion of this subject now in preparation.